From Science to Service: A Framework for the Transfer of Patient Safety Research into Practice

Veronica F. Nieva, Robert Murphy, Nancy Ridley, Nancy Donaldson, John Combes, Pamela Mitchell, Christine Kovner, Elizabeth Hoy, Deborah Carpenter

Abstract

A conceptual framework was developed to help maximize and accelerate the transfer of research results from AHRQ's patient safety research portfolio to health care delivery. The framework can be used by the patient safety portfolio as well as individual researchers to develop plans, tools, and strategies for moving research into practice. The framework presents three major stages in moving research findings toward utilization:

- **Knowledge creation and distillation**. New knowledge generated by the AHRQ research portfolio covers a broad array of topics and differs in the extent to which specific findings are ready for translation into practice. The knowledge produced needs to be evaluated, synthesized and prioritized for translation efforts.
- **Diffusion and dissemination.** The framework posits the importance of developing partnerships with knowledge brokers and connector organizations to effectively reach a variety of end users in two ways: mass diffusion and targeted dissemination. The goal of mass diffusion is providing information and raising general awareness, while the goal of targeted dissemination is persuading and motivating potential knowledge users into action.
- **End user adoption, implementation, and institutionalization.** In order to transition from abstract knowledge to concrete use, research findings must be translated into "intervention packages" that include guidelines, information materials, training, and other implementation aids. The end users must have a change leader and team. General intervention tools need to be adaptable to local needs and go through several iterations to ensure fit between the conceptual intervention and the organizational context. As the intervention gains acceptance and feasibility within the organization, it is institutionalized in official policies and procedures.

Report Documentation Page

Form Approved
OMB No. 0704-0188

1. REPORT DATE	2. REPORT TYPE	3. DATES COVERED
2005	**N/A**	**-**

4. TITLE AND SUBTITLE	5a. CONTRACT NUMBER
From Science to Service: A Framework for the Transfer of Patient Safety Research Into Practice	5b. GRANT NUMBER
	5c. PROGRAM ELEMENT NUMBER
6. AUTHOR(S)	5d. PROJECT NUMBER
	5e. TASK NUMBER
	5f. WORK UNIT NUMBER
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) **Agency for Healthcare Research and Quality 540 Gaither Road, Suite 2000 Rockville, MD 20850**	8. PERFORMING ORGANIZATION REPORT NUMBER
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)	10. SPONSOR/MONITOR'S ACRONYM(S)
	11. SPONSOR/MONITOR'S REPORT NUMBER(S)

12. DISTRIBUTION/AVAILABILITY STATEMENT
Approved for public release, distribution unlimited

13. SUPPLEMENTARY NOTES
Published in Advances in Patient Safety: From Research to Implementation. Volumes 1-4, AHRQ Publication Nos. 050021 (1-4). February 2005. Agency for Healthcare Research and Quality, Rockville, MD. http://www.ahrq.gov/qual/advances/

14. ABSTRACT

15. SUBJECT TERMS

16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON
a. REPORT	b. ABSTRACT	c. THIS PAGE			
unclassified	**unclassified**	**unclassified**	**UU**	**14**	

Introduction

"Research is only a beginning, and not an end in itself."

—Carolyn Clancy, Director, AHRQ[1]

Translating research into improvements in clinical patient outcomes is integral to the mission of the Agency for Healthcare Research and Quality (AHRQ). This mandate is an important element of the agency's patient safety initiative, a multi-year program of more than 100 grants and contracts that was launched in late 2001.

In response to this mandate, the AHRQ Patient Safety Research Coordinating Center (PSRCC) and its steering committee developed the conceptual framework described in this paper to assist in the dissemination of research findings among grantees and, more importantly, among point-of-care providers who directly influence the quality of patient care. The broad objective of this framework is to maximize and accelerate the utilization of results emerging from AHRQ's patient safety portfolio of grants and contracts.

The framework is intended to provide a conceptual structure to guide the dissemination and implementation work of the patient safety research initiative. In this framework, we suggest a variety of activities and new roles for researchers; end users in the health care community; and organizations and opinion leaders who could be important intermediaries in moving the findings and products from researchers to practice and service settings.

Background

Historically, research findings have moved slowly and incompletely into a wide variety of practice settings.[2] Medical practice is no different.[3, 4] A recent view of existing literature, for example, showed that it takes an average of 17 years to turn 14 percent of original research findings to the benefit of patient care.[4] This slow pace is the result of a research supply model that takes research through various cycles of review and replication, leading to identification of best practice guidelines, which are then only partially adopted in practice settings.

Many reasons have been found for the difficulty of moving research into practice:

(1) Medical practitioners are inundated with at least 2 million published medical articles a year;[5]

(2) There is an overwhelming amount of new information, often ambiguous or contradictory in terms of implications for use; and

(3) Complex and fragmented organizational and professional health care systems, faced with many cost and regulatory pressures, frequently present inhospitable settings for implementing change.

In this paper, we have developed a framework that synthesizes concepts from various related literatures of knowledge transfer, social marketing, social and organizational innovation, and behavior change. We combine traditional "information-push" approaches with proactive partnerships intended to create "information-pull" forces by enabling ongoing dialogue between researchers and representatives of front-line providers and health delivery settings. These partnerships for dissemination could be important venues for bridging the well-documented gaps between the research and knowledge creation perspectives and those of health care practitioners and delivery organizations.[6, 7]

Stemming from the emphasis on partnerships and end user involvement, the framework stresses the importance of defining, understanding, and working with various target audiences and user communities at all stages of the knowledge transfer process. The eventual users of patient safety research include a large and complex set of institutions and many different types of professionals, including administrators and managers, and health care professionals, such as physicians, nurses, pharmacists and laboratory technicians. The varying needs, motives, and constraints of all these groups must be addressed in the knowledge transfer process. Thus, one size does not fit all: different classes of research findings and tools relevant to various user groups call for tailored dissemination pathways. In addition, there is no silver bullet— multifaceted interventions that are mutually reinforcing are necessary to create behavior and organizational change.[8, 9]

The framework is summarized in Figure 1. The graph presents three major knowledge transfer stages: knowledge creation and distillation, diffusion and dissemination, and organizational adoption and implementation of innovations. We suggest that the transfer of research evidence into health care delivery settings can be facilitated by the general processes discussed here. One should note that, while the framework is portrayed as a series of stages, we do not believe that the knowledge transfer process is linear. Activities can occur simultaneously, or in different sequences. Moving research results into practice is a multifaceted process, involving many actors and systems.

The framework starts with the complex process of determining what findings from the patient safety research portfolio or individual research projects ought to be disseminated. This stage is particularly critical—and potentially difficult—for any large research project, such as AHRQ's patient safety research portfolio. Once the appropriate knowledge and product clusters have been determined, several processes need to be activated to create the relevant changes in clinical practice settings. In general, such processes include priming interest, or creating "pull" from the end users; enabling and facilitating the adoption and implementation decisions; and reinforcing the changes that are institutionalized as new standard modes of operation.[10, 11]

The stages and processes of knowledge transfer shown in Figure 1 are discussed further in the remainder of the paper. While we expect that the framework applies to the overall patient safety research portfolio as well as to individual patient safety projects, we hope it is relevant to other research

Figure 1. Knowledge transfer framework for AHRQ patient safety portfolio and patient safety grantees

	1 Knowledge creation and distillation	2 Diffusion and dissemination	3 Adoption, implementation, and institutionalization
Process	1a Creation of new knowledge, practices, or products 1b Distillation of key knowledge, practices or products	2a Creation of dissemination partnerships/ knowledge transfer teams 2b Mass diffusion of key knowledge and products 2c Targeted dissemination/ persuasion	3a Development of interventions 3b Adoption and implementation 3c Confirmation, adaptation and internal institutionalization 3d External institutionalization/ routinization
Knowledge and dissemination sources	Patient Safety Grantees IOM National Quality Forum Expert panels Professional and policy associations	• AHRQ OCKT • AHRQ User Liaison Program • Knowledge broker organizations (e.g., IHI, NPSF, QuIC)	• Dissemination partnerships • Connector organizations
Actors			
Target Audiences	• Media • Academic journals • Professional conferences • Professional organizations, Websites	• Knowledge broker and connector organizations (e.g., AHA, ISMP, ANA, JCAHO) • Educational institutions • Professional leaders	• Adopter organizations • Health care delivery orgs. • Educational institutions • Device manufacturers • Regulators • Adopter organizations • Regulators • Credentialing organizations • Insurers • Public policy advocates
Activities	Research projects Evidence summaries/ syntheses papers Consensus processes for priorities	• Academic publications • Conference presentations • Fact sheets • Press pieces • Websites • General communication materials • Workshops/Webcasts • Audience analysis • Segmentation analysis • Barrier analysis • Stakeholder analysis • Partnership and KTT development • Tailored messages and communications • Intervention packages	• Implementation tools • Training • Cultural assessments • Technical assistance • Help line user groups • Organizational communications • Internal stakeholder analysis • Cost benefit analysis • Standards and guidelines • Monitoring and measurement tools • Institutional policy changes

initiatives that aim to facilitate the uptake of research evidence in practice settings.

Knowledge creation and distillation

The first stage in the framework is the creation of new knowledge and the process of sifting through that knowledge to identify actionable products and findings appropriate for particular end users. This sifting process has been labeled "knowledge distillation."

1a. Creation of new knowledge

New knowledge can come from a variety of sources, including researchers at academic medical centers, delivery systems, medical groups, health plans, and other stakeholders. Foundations, government agencies such as AHRQ, and other organizations can serve as vital facilitators of such knowledge creation. For example, within its patient safety portfolio alone, AHRQ supports the creation of new knowledge through more than 100 research and demonstration grants and contracts, which will generate a broad array of research findings and products within the next year.

The knowledge produced will vary greatly in terms of its readiness for utilization within health care delivery systems. Some of the new knowledge will emerge from basic research in its early stages. These findings will likely require further research before they can be considered for adoption and implementation in medical practice. Other projects (e.g., the evaluation of educational approaches and curricula, identification of best practices regarding organizational and systems-based processes, studies on the effectiveness of medical informatics tools) may create knowledge and products that can be adopted and implemented more quickly in a receptive environment. New knowledge will also vary greatly in other respects, such as the importance of its contribution to science, the strength and appropriateness of its supporting evidence, and the extent to which it supports or deviates from existing bodies of knowledge in the field.

1b. Knowledge distillation

Because the knowledge generated in the patient safety portfolio is extensive and variable, it needs to be inventoried, synthesized, evaluated, and prioritized for dissemination. The knowledge distillation process aims to identify results that are valid for generating action. These results are then forged into "actionable" messages or products[12] relevant to particular audiences and end users. Achieving agreement on what is actionable is potentially a big challenge; the distillation process can help to forge consensus. Knowledge distillation helps to reduce the signal-to-noise ratio for potential users and dissemination agents by emphasizing findings that are both important and actionable, thus increasing the likelihood that research evidence will find its way into practice.

The distillation process involves an assessment of the new knowledge produced by the patient safety research portfolio in the context of the entire relevant body of research literature and the practical tacit knowledge of health care professionals. The process may take a variety of forms, including development of evidence summaries and synthesis papers, and the use of expert panels and structured consensus processes for identifying priorities and actionable findings and products.

It is important that the knowledge distillation process be guided by the ultimate goal facilitating dissemination and promoting implementation of research findings and products relevant to specific target audiences. This goal should be reflected in the composition of the groups conducting distillation activities. While researchers or knowledge creators can and should be important participants in this process, the imperative of moving research into practice means that other organizations that have a broader perspective should be represented as well. For example, for AHRQ's patient safety portfolio, distillation activities might include some research grantees and various external groups well versed in the practice of developing evidence syntheses (e.g., Institute of Medicine, the National Quality Forum, and the Cochrane Collaborative). Additionally, perspectives of relevant professional and policy associations (e.g., the American Physicians and American Nurses Associations, the American Hospital Association, and the Joint Commission on Accreditation of Healthcare Organizations), who may not have been traditionally involved in the knowledge distillation function, should be included.

It follows that the criteria used in knowledge distillation should reflect the concerns of potential knowledge users (e.g., transportability to real life conditions, feasibility, and the evidence needs of health care delivery organizations and clinicians), as well as traditional scientific considerations (e.g., strength of evidence, consistency with other knowledge, and generalizability across populations and settings).[11, 13, 14] Balancing the need to move promising findings and tools more quickly into practice settings with scientific requirements for rigor and replication is a critical task for the knowledge distillation process.

Diffusion and dissemination

The second stage in the framework involves partnering with professional opinion leaders and health care organizations to disseminate actionable knowledge to potential users.

2a. Creation of dissemination partnerships and knowledge transfer teams

The framework calls for the development of dissemination partnerships that can help garner scientific and professional support for key research results and products to facilitate their adoption and implementation in everyday practice. Dissemination partnerships link knowledge sources (researchers and knowledge

distillers) with potential intermediaries (individuals and organizations that can function as knowledge brokers and connectors to the practitioners and delivery organizations in the health care system).

Partnerships that involve knowledge broker organizations (e.g., Institute for Healthcare Improvement, National Patient Safety Foundation, academic publishers, media, and educational institutions) can amplify awareness of the research findings among interested professionals and the public. Partnerships with membership organizations serving specific constituents (e.g., American Medical Association, American Nurses Association, and the Institute for Safe Medication Practices) can also be particularly effective. Acting as intermediaries between the knowledge and user communities, these connector organizations can help ensure that research-based recommendations actually influence the way medicine is practiced.[4] They can do so by identifying priorities for dissemination, shaping key messages and broad guidelines for specific target audiences, and developing specific interventions for adoption by potential user organizations.

Dissemination partnerships are vital to developing the network of support needed to facilitate the transfer of research into practice because they provide an authoritative "seal of approval" for new knowledge and help identify influential individuals, informal networks, and organizations to champion these research-based recommendations. These partnerships actively contribute to the knowledge transfer process, helping to create demand, or "pull," from the user community by leveraging off existing relationships among health care professionals and organizations. In addition to facilitating transfer by using well-established and credible messengers, dissemination partnerships bring in relevant contextual knowledge about end-user environments, motivations, and constraints that smooth the transition from research to practice.

Focused dissemination partnerships can take the form of multidisciplinary knowledge transfer teams, such as those that have been effective in disseminating research-based cancer prevention programs.[15] These teams—comprising researchers, representatives from intermediary and end-user organizations, and representatives of AHRQ dissemination offices and programs—create tools to promote adoption and minimize barriers among relevant health care organizations and clinicians. To translate knowledge into more usable formats, they may develop prototype or model intervention packages that capture the essence of the research-based change(s) and offer incentive structures that address potential barriers and facilitate adoption and implementation of the intervention. Functioning as boundary spanners, these knowledge transfer teams would identify what decisionmakers in user organizations need to know; explore the policy and organizational implications of implementing new research findings within particular settings; determine the relative benefits and costs of the change for particular organizations; and stimulate support among important stakeholder groups.

2b and 2c. Mass diffusion and targeted dissemination

In the framework, actionable, evidence-based research findings can reach audiences in two ways: mass diffusion and targeted dissemination or marketing. Using both strategies in parallel will help the research findings and products reach "the tipping point"— the stage where the pace of adoption of a new idea, product, or process accelerates markedly, largely because there are enough early users to convince the remaining holdouts to adopt the innovation.[16]

In broad terms, mass diffusion involves broadcasting information to broadly defined audiences, with the objective of sharing knowledge and creating awareness. The typical mechanisms for mass diffusion of research results and innovations are journal publications and professional conferences. Other one-way information transmission approaches (e.g., fact sheets, newsletters, and Web sites) are used as well. In addition, the national and local media can be used to share information with policymakers, professional audiences, and the public at large.

Targeted dissemination involves planning for the delivery of specific messages to particular audiences using appropriate transmission mechanisms and messengers. While the objective of mass diffusion is providing information and raising awareness, targeted dissemination intends to persuade, influence, and motivate action. Targeted dissemination has taken the form of one-way "information-push" mechanisms, such as continuing medical education (e.g., workshops and conferences) and clinical guidelines. In general, these methods have been found wanting in their ability to create lasting change.[17, 18]

Our framework extends beyond the information-push models. We suggest that targeted dissemination efforts be conducted by partnerships involving knowledge sources working alongside knowledge broker and connector organizations, which can use the means at their disposal to communicate with and influence their particular constituencies. Many studies [8, 19] show that these partnerships could develop multi-faceted dissemination strategies for patient safety research, with an emphasis on the channels and media that are most effective for particular user segments. Information-push methods should be supplemented by more interactive and personalized opportunities, including workshops and working sessions with representatives of knowledge broker and connector organizations.

The effectiveness of these efforts depends on having comprehensive strategic plans for targeted dissemination. A transfer strategy for any particular knowledge or product cluster should specify a coherent and mutually reinforcing set of activities aimed at communicating key messages and enhancing the capacity of the target professionals and organizations to comprehend and act in response to those messages. Specific audiences and stakeholders must be identified, and their missions, needs, and contexts understood, in order to develop initiatives that will be adopted by the user organizations and health care professionals. It is particularly important to understand how potential innovators and early adopters and their professional networks within end-user organizations can be mobilized to extend the transfer of knowledge within their organization.

End user adoption, implementation, and institutionalization

The final stage in the knowledge transfer process relates to getting organizations and individuals to adopt and consistently use evidence-based research findings and innovations in everyday practice. Despite much variety in the manner in which particular evidence-based innovations take hold in practice settings, studies of innovation processes suggest that most innovation adopters experience similar processes: becoming aware of the innovation, persuasion (or forming a favorable position toward the innovation), decision (commitment to its adoption), implementation, and confirmation (reinforcement based on positive results).[10]

3a and 3b. Intervention development, adoption, and implementation

One must distinguish between the scientific rationale for implementing new processes or treatments and the decision to implement those innovations in a particular organization. Implementation of innovative evidence-based practices in operational practice settings involves complex interrelationships among the innovation itself, the organizational structures and values, the external environment, and the individual clinicians.[11, 19] For new evidence-based practices or processes to be adopted within particular settings, a "change champion" must often overcome a variety of barriers, e.g., the lack of clear structures for evaluating and adopting evidence-based practices, lack of incentives and training for individuals and teams to adopt such innovations, the complexity of the required change, existing regulatory and accreditation requirements, and the staff and capital costs involved.[10, 20–22]

Initial implementation of innovation is often conducted as pilot or demonstration program within particular sections of the adopting organization. This approach is often used to ensure the fit of the innovation to the particular organizational context and to judge whether the innovation is meeting its objectives. In addition to a change champion, it is useful to activate multidisciplinary implementation teams[23, 24] to assist in the practical aspects of embedding innovations into ongoing organizational processes. These teams can help in creating new processes, assessing intended and unintended consequences, monitoring feedback, modifying elements of the innovation as required, and carefully orchestrating the implementation rollout to obtain the support of key individuals or groups. During the initial implementation stages, "reinvention" often occurs. Reinvention is an important process in which the adopting organization essentially begins to look at the innovation as being its own. Berwick[25] suggests that reinvention is necessary for organizations to achieve successful, lasting implementation of change.

Changing practice takes a considerable amount of individual and organizational effort, and that effort must be sustained over time. Most end users will need assistance in taking abstract knowledge, and even prototype

interventions, and applying them in their particular contexts. Many users must initiate organizational and process changes before research findings can be consistently adopted and implemented throughout their organizations. For example, in order for change to occur, the organization's practice culture needs to support action and facilitate appropriate change processes.[26] Supporting action and change requires coordination, communication, and dissemination of information. The benefits of being open to change must be made evident throughout the organization.

External support for change may come from the knowledge transfer teams described earlier. These teams can have important continuing roles during the adoption and implementation stages of the transfer process. Knowledge transfer teams can offer expert assistance to the implementation teams in the adopting organizations, helping them to identify and address specific institutional and professional barriers to adopting the innovation. They can assist the implementation team in translating theoretical research findings or previously developed prototype interventions into organization-specific structures, operating procedures, training, and information tools.

3c and 3d. Confirmation, adaptation, and institutionalization

When sufficiently visible, and with support from the necessary authorities, pilots can become an internal dissemination agent for the larger organization. Early pilot successes—for example, when the innovation alleviates the problem addressed—can create their own momentum, inspiring other units within the organization to follow suit. This "internal" spread depends on key personnel in other units being aware of the issues addressed, the innovation being tested, the results of the pilot, and the implications for their units if the innovation is successful.

If an innovation is successful and it is adopted within the relevant units of an organization, the decision to sustain the innovation usually goes through confirmation and routinization stages. The confirmation process involves key personnel affirming the decision to adopt the innovation, given all the information available and the effort required to actually implement and sustain the innovation. Efforts to sustain an innovation include dealing with changes in personnel responsibilities and practices, processes, and, perhaps, power structures. Discontinuance of an innovation, due to lack of attention to these matters, is not uncommon.[27] Backsliding and slippage are commonly suffered by innovations that have been initially adopted, but not continually supported from within the organization, as well as by its external environment. The length and complexity of the confirmation process depends on the nature and scope of the innovation. Generally, it lasts until the innovation enters the routinization or institutional stage.

Once key organizational personnel commit to the innovation, the innovation is incorporated into the structure of the organization. This is the routinization stage.[28] Personnel and practice responsibilities are assigned, and policies,

procedures, rules, regulations, and job descriptions are developed. The change is no longer an innovation; it is the standard for the organization. At this point, tracking the experience of the organization relative to the original problem addressed provides confirmation that improvement has occurred and it can also provide the organization with an example that its effort to change has been rewarded, improvements have been made, and are being sustained. The monitoring could lead to the question of how further improvements could be made in a continuous improvement environment.

As institutionalization proceeds, adopting institutions can serve as agents for further dissemination by sharing their experiences and lessons learned. Continuing knowledge transfer teams may provide a venue for collecting feedback from early adopters that can serve to improve the prototype model intervention packages, and reflect practical experiences in practice settings.

In the movement toward institutionalization and spread of change to other organizations, external forces, such as regulatory and credentialing organizations, can play important roles, thus necessitating attention in later stages of dissemination efforts. When there is a sufficient base of success in operational practice settings, the imprimatur of credentialing organizations, such as Joint Commission on Accreditation of Healthcare Organizations (JCAHO) and State licensure agencies for health care systems, can play a powerful role in furthering implementation. Mandates from regulatory agencies provide an important incentive needed by later adopters.

Conclusions and implications

This paper has discussed a conceptual framework for the more effective and efficient transfer of patient safety research knowledge to the practice settings where patients receive medical services. At the center of the framework is an understanding that new linkages must be forged among three major parties involved in this transfer: the creators and distillers of knowledge, the professionals and health systems who are the end users of such knowledge, and the various parties that can serve as knowledge brokers and intermediaries.

The framework calls for these parties to engage in new forms of ongoing collaboration to enable the development of multifaceted audience-driven strategies needed to translate science into service. New ground needs to be broken to operationalize the broad concepts described in this paper. Scientists and researchers do not yet typically include an implementation perspective in developing and conducting their research and few practicing clinicians and health care delivery systems have the interest or capacity to bridge the gap between their medical practices and the arcane world of research. Potential intermediary organizations may have to broaden their missions to incorporate the functions suggested in this framework.

The processes described in the framework will require focus and support. Health care professionals and organizations will need encouragement, incentives

and technical assistance[29] to take on these unfamiliar roles and engage in the interactions that would facilitate the utilization of research knowledge where it counts most.

Acknowledgments

This paper emerged from discussions among members of the dissemination subcommittee of the AHRQ-PSRCC (Patient Safety Research Coordinating Committee) Steering Committee conducted in 2003 and chaired by Nancy Ridley, M.S. Previous versions of the framework presented here were discussed in a full Steering Committee meeting, chaired by C. Andrew Brown, M.D.

Author affiliations

Westat (VN, BM, DC); Massachusetts Department of Public Health (NR); University of California, San Francisco (ND); The Hospital & Health System Association of Pennsylvania (JC); University of Washington (PM); New York University (CK); and Polaris Consulting (EH).

Address correspondence to: Veronica Nieva, Ph.D.; AHRQ-PSRCC, Westat, 1650 Research Blvd. Rockville, MD 20850. Phone: 301-251-8271; e-mail: veronicanieva@westat.com.

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